UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/679,419	10/07/2003	Jean L. Lee	50103-538	3466

7590 10/15/2004

MCDERMOTT, WILL & EMERY
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 10/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/679,419	**Applicant(s)** LEE ET AL.	
	Examiner Nikolas J. Uhlir	**Art Unit** 1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.
4a) Of the above claim(s) *10-18,20 and 21* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-5,8,9 and 22* is/are rejected.
7)☒ Claim(s) *6,7 and 19* is/are objected to.
8)☒ Claim(s) *1-22* are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *07 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *1/21/2004*.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-9, 17, 19, and 22, drawn to a perpendicular magnetic recording medium, classified in class 428, subclass 694+.

   II. Claims 10-16, 18 and 20-21, drawn to a method for making a magnetic recording medium involving a forming the magnetic layer below a specified temperature and/or via sputtering, classified in class 427 subclass 127 or class 204 subclass 192.1.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product could be made via another and materially different process. For example the product could be made by depositing at a substrate temperature of 71^0 C or via chemical vapor deposition.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

5. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Aaron Weisstuch on 08/30/04 a provisional election was made with traverse to prosecute the invention of the product, claims 1-9, 19, and 22. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-16, 18, and 20-21 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

7. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Information Disclosure Statement

8. The examiner has considered the information disclosure statement (IDS) dated 1/21/2004. A signed copy of the IDS accompanies this office action.

Drawings

9. The examiner accepts the drawings dated 10/07/2003.

Specification

10. The abstract of the disclosure is objected to because it is more then one paragraph. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uwazumi et al. (US2003/0064253A1) in view of Oyanagi et al. (US6066380) and Kirino et al. ("Influence of Seedlayer on Film Microstructure of Co-Cr-Pt Longitudinal Recording Media Fabricated on Plastic Substrates," IEEE Transactions on Magnetics, Vol. 36, No.5 September 2000, pp. 2348-2350).

13. Claim 1 requires a perpendicular magnetic recording medium, comprising: (a) a substrate of an amorphous thermoplastic polymer material having sohening and glass transition temperatures as low as about 95 ^{0}C; and (b) at least one stack of thin film layers formed on at least one surface of said substrate, said at least one layer stack including at least one granular magnetic recording layer of perpendicular type; wherein the coercivity (Hc) of said perpendicular magnetic recording medium is at least about 4,000 Oe.

14. Uwazumi teaches a perpendicular magnetic recording medium comprising a non-magnetic substrate (1), a non-magnetic alignment control layer (2) on the substrate, a

seed layer (3) on the alignment control layer, a non-magnetic underlayer (4) on the seedlayer, a magnetic layer (5) on the seedlayer, and a protective layer (6) on the magnetic layer (figure 2; sections 6 and 16-17). The alignment control layer, seedlayer, and magnetic layer are considered equivalent to applicants claimed stack. In a specific embodiment, Uwazumi uses W as the alignment control layer, Pt as the seedlayer, Ru as the underlayer, and CoCrPt with SiO_2 grain boundaries (a so called granular magnetic layer) as the magnetic layer (sections 34 and 41, table 3). This media exhibited a coercivity of 3600 Oe (table 3)

15. Uwazumi et al. does not teach the use of an amorphous polymer substrate having a T_g as low as ~95^0C, as required by claim 1. Further, Uwazumi does not teach a medium exhibiting a coercivity of at least about 4000 Oe, as required by claim 1.

16. Regarding the substrate, Oyanagi teaches that amorphous polymers having a T_g's of at least 100 ^{0}C or more, such as amorphous polycarbonates, polyethersulfones, and polyetherimides are suitable for forming magnetic recording media substrates (column 4, lines 19-40). These materials can be injected molded to form recording media substrates having excellent smoothness, which results in the recording media exhibiting high reliability (column 2, lines 45-50).

17. Therefore it would have been obvious to one of ordinary skill in the art to use a polycarbonate, polyethersulfone, or polyetherimide substrate having a T_g of at least 100 ^{0}C to form the substrate utilized by Uwazumi.

18. One would have been motivated to make this modification in view of the teaching in Uwazumi that Polycarbonate substrates are suitable, and the teaching in Oyanagi

that by using an amorphous polycarbonate having a T_g of at least 100 ^{0}C as a magnetic recording media substrate, the surface smoothness of the substrate is improved, resulting in the media exhibiting improved reliability. One would have been motivated to select amorphous polyetherimide or amorphous polyethersulfone in view of the fact that Oyanagi teaches the equivalency of these polymers to amorphous polycarbonate for the purpose of forming a magnetic recording media substrate.

19. Regarding the coercivity, Kirino teaches the impact of seedlayer composition on the coercivity of a magnetic recording medium having the structure: substrate/seedlayer/underlayer/magnetic layer/protective layer. In table 3, Kirino establishes that a medium utilizing a hcp Ti seedlayer exhibits an increase in coercivity of ~400 Oe over that of the same medium utilizing a bcc W seedlayer (table 3). Further, the medium utilizing a Ti seedlayer exhibits better squareness then the medium using a W seedlayer.

20. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Ti in stead of W as the alignment control layer in Uwazumi as modified by Oyanagi.

21. One would have been motivated to make this modification in view of Kirino's teaching that media using Ti seedlayers exhibit higher coercivity and squareness then those using W seedlayers.

22. It is the examiners position that when the Ti seedlayer of Kirino is utilized as the alignment control layer in Uwazumi as modified by Oyanagi, applicant's claimed coercivity requirement is met. The Kirino reference clearly shows that utilizing a Ti

seedlayer will result in a medium exhibiting an increase in coercivity of 400 Oe over that of a medium using a W seedlayer. Given that Uwazumio teaches a medium using a W alignement control layer (equivalent to a seedlayer) has a coercivity of ~3600 Oe, the 400 Oe increase provided by the Ti seedlayer would result in a medium meeting applicants claimed coercivity. However, should this be traversed, the examiner takes the position that the coercivity requirement would flow naturally from following the suggestion of the prior art, and that this requirement will be necessarily met by the proposed combination of references.

23. Claims 2 and 3 limit the amorphous polymer substrate to one of five materials,l and homopolymers, copolymers, or terpolymers thereof. These claims are met as set forth above for claim 1.

24. Claim 4 requires the stack of claim 1 to comprise a combined seed/adhesion layer, at least one soft magnetic layer, at least one non-magnetic underlayer, at least one granular magnetic recording layer wherein oxides or nitrides provide physical decoupling between adjacent magnetic grains, and a protective layer. The examiner interprets applicants claimed "combined seed/adhesion layer" to require either a single layer that can function as both a seed and an adhesion layer, or two layers wherein each layer acts as either a seed layer or an adhesion layer.

25. Bearing this interpretation in mind, the examiner considers the Ti alignment control layer taught by Uwazumi as modified by Oyanagi and Kirino to be equivalent to applicants claimed combined seed adhesion layer. This layer not only controls the alignment of the layers deposited above it (the function of a seedlayer), but also

adheres to the substrate (the function of an adhesion layer). Regarding the soft magnetic layer, Uwazumi teaches that the seed layer can be a soft magnetic material, such as NiFe (section 28).

26. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a soft magnetic material such as NiFe as the seed layer of Kirino, as the reference recognizes the equivalency of soft magnetic materials to the other materials listed as suitable for use as a seedlayer.

27. Regarding the underlayer. The examiner considers the underlayer of Kirino, which is formed of Ru in some embodiments (see section 34), to be equivalent to applicants claimed underlayer.

28. Regarding the magnetic layer, Uwazumi teaches a granular magnetic layer having oxides or nitride grain boundaries (section 19). Though not expressly stated, the oxide or nitride grain boundaries will necessarily provide physical decoupling of the magnetic grains, as the presence of oxides and nitrides are known in the art to produce this effect.

29. Claim 5 requires essentially the same limitations as claim 4, but limits the materials which are to form each layer in the stack. These compositional requirements are met as set forth above, except for the requirement that the magnetic layer be carbon. However, Uwazumi teaches the use of a carbon protective layer (section 34). Thus, all of the limitations of claim 5 are met.

30. Claims 8-9 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uwazumi as modified by Oyanagi and Kirino as applied to claims 1-5 above, and further in view of Sugita et al. (US4687712).

31. Uwazumi as modified by Oyanagi and Kirino fail to teach a magnetic reocridng medium comprising a plurality of stacked soft magnetic underlayer/wetting layer pairs and a soft magnetic layer as required by claim 8, wherein the layers have the composition required by claim 9.

32. However, the examiner notes that Uwazumi does teach using a FeNi soft magnetic layer beneath an Ru layer (section 34). The examiner further notes that Uwazumi teaches the user of Ti underlayers (section 22)

33. Bearing this in mind, Sugita teaches that the reproducing output of a magnetic recording medium utilizing a plurality of soft magnetic layers separated by intermediate non-magnetic layers is improved over that of a recording medium utilizing a single thick soft magnetic layer (column 2, lines 10-17 and figure 4). Each soft magnetic layer can be formed from permally (a NiFe alloy), and each non-magnetic intermediate layer is suitable formed from Al, Si, Cu, To, Al_2O_3 or SiO_2 (column 30-40). In a particular embodiment, 3 permalloy layers separated by 2 non-magnetic layers are utilized beneath a magnetic layer of a magnetic recording medium (column 5, lines 40-52 and figure 9). A Ti layer separates the laminated soft magnetic layer from the magnetic layer (column 5, lines 40-52). This medium exhibited improved reproduction output over that of a medium having only one soft magnetic layer (column 5, lines 40-52)

34. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize substitute the laminate soft magnetic layer taught by Sugita, specifically a laminate soft magnetic layer utilizing NiFe as the soft magnetic material and Cu as the spacer, for the soft magnetic seed layer of Uwazumi as modified by Oyanagi and Kirino.

35. One would have been motivated to make this modification in view of the fact that Uwazumi as modified by Oyanagi and Kirino utilizes a single soft magnetic layer, and the teaching in Sugita that reproduction output is increased by using a laminate soft magnetic layer, in particular a laminate of 3 soft magnetic layers separated by non-magnetic interlayers results in a media exhibiting improved reproduction output. One would have been motivated to select NiFe and Cu as the materials for the laminate soft magnetic layer in in view of the fact that both Sugita and Uwazumi as modified by Oyanagi and Kirino teach the use of NiFe layers, and because Sugita recognizes the equivalence of Cu to the other materials listed as suitable for the interlayers.

36. When the laminate soft magnetic layer of Sugita is substituted for the single soft magnetic layer in Uwazumi as modified by Oyanagi and Kirino, the limitations of claims 8 and 9 are met. The examiner considers the Ti alignment control layer of Uwazumi as modified by Oyanagi and Kirino to be equivalent to applicants claimed combined seed/adhesion layer. The first four layers (NiFe/Cu/NiFe/Cu) of the laminate soft magnetic layer are considered to be equivalent to applicants claimed plurality of soft magnetic layer/wetting layer pairs. The last NiFe layer in the laminate soft magnetic layer is equivalent to applicants claimed soft magnetic underlayer. The Ru underlayer is

equivalent to applicants underlayer. The granular magnetic layer and carbon protective layer are met as set forth above.

Claim 22 requires a magnetic recording medium manufactured by the process of claim 21. The method limitations in claim 22 are process limitations in a product claim and do not appear to be further limiting in so far as the structure of the product is concerned. Even though product claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113.

37. Bearing this in mind, the structure of the product in claim 22 is considered to be the same as the product of claim 9. Thus, the limitations of claim 22 are met as set forth above for claim 9.

Allowable Subject Matter

38. Claims 6-7, 17 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

39. The following is a statement of reasons for the indication of allowable subject matter: Claims 6-7, 17 and 19 require the use of a $FeCo_{30.6}B_{12.5}$ alloy as the soft magnetic layer. While the use of FeCoB as a soft magnetic material in a magnetic recording medium is known, as shown by Kong et al. ("Soft Magnetic Underlayer With

Multilayer Structure For Perpendicular Magnetic Recording Media," IEEE transactions on Magnetics, Vol. 39, No. 5, September 2003, pp. 2338-2340), there is no teaching or motivation in the prior art to utilize the particular FeCoB alloy required by the applicant in claims 6-7, 17 and 19.

40. The examiner notes that claims 17 and 19 are product claims that are dependent on method claims. These claims would be allowable if rewritten as independent "product by process" claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 571-272-1517. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 571-272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NJU

D. S. Nakarani
D. S. NAKARANI
PRIMARY EXAMINER